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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/511,517	06/08/2005	Michael A. V. Ward	6050 P58 US	4425

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EXAMINER	
ALI, HYDER	

ART UNIT	PAPER NUMBER
3747	

DATE MAILED: 12/23/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/511,517	WARD, MICHAEL A. V.	
	Examiner	Art Unit	
	HYDER ALI	3747	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-20 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-20 is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on 15 October 2004 is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Specification

This application does not contain an abstract of the disclosure as required by 37 CFR 1.72(b). An abstract on a separate sheet is required.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

1. Claims 1,4-20 are rejected under 35 U.S.C. 102(b) as being anticipated by Ward (US 6,267,107).

As to Claim 1, Ward discloses an internal combustion engine for igniting, combusting, and expanding a burnt air-fuel mixture and producing work by means of a movable piston 5 within a cylinder that has a cylinder head 6 with the combustion chamber located mainly in the head, and further including squish lands for producing high squish-flow and turbulence as the piston 5 nears top center at the engine compression stroke, the system constructed and arranged to have one or more spark plugs 12a/118, 12b/118a positioned and oriented such that as the piston 5 approaches top center, intense air flow passes through the spark gap to move and spread the spark towards the center of the combustion chamber, the improvement comprising means for improving the lean burn capability of the engine under light load conditions and the knock rating under high loads by one or more of the following: a) two spark plugs

12a,12b at or near the edge of a high squish region controlled such that at light loads both plugs are fired, and at high load only one plug is fired; b) direct fuel injection means 18 wherein intense air-flow interacts with at least part of the injected fuel; c) direct fuel injection means 18 with air-blast assistance and with at least one spark gap included within the fuel injection means to be subjected to the air-blast; d) variable compression ratio means, with high compression ratio at light loads and lower compression ratio at high loads.

As to Claim 4, Ward discloses two spark plugs are used and wherein the two plugs have different spark gap widths.

As to Claim 5, Ward discloses the plug nearer the exhaust valve 8 has the smaller spark gap and is fired by itself at high loads, versus both being fired at light load.

As to Claim 6, Ward discloses the fuel introduction means is essentially centrally located fuel injection means.

As to Claim 7, Ward discloses one or more essentially radially outwards fuel injection sprays collide with squish land induced radially inwards squish flow.

As to Claim 8, Ward discloses at least one of one or more spark plugs are located at the edge of the squish zone with which the fuel injection spray interacts.

As to Claim 9, Ward discloses fuel injection includes air-blast means surrounding the fuel spray.

As to Claim 10, Ward discloses spark gap ignition means is also contained in the air-blast fuel injection means.

As to Claim 11, Ward discloses the air blast entry in above the fuel entry means which is in turn above the spark gas means, defining a three-part system.

As to Claim 12, Ward discloses three-part system is essentially circularly symmetric.

As to Claim 13, Ward discloses three-part system is located in the center of the cylinder head of a four valve engine.

As to Claim 14, Ward discloses variable compression ratio means are provided, with high compression ratio at light loads and lower compression ratio at high loads.

As to Claim 15, Ward discloses variable compression means is achieved by having piston top, at the high compression condition, approach as close as practical to the cylinder head without hitting it, defining a very small squish clearance and very high flow, and having the piston further away at low compression ratio.

As to Claim 16, Ward discloses the high compression ratio is approximately 15 to 1.

As to Claim 17, Ward discloses variable compression ratio is achieved by having an "H" annular groove within the piston held by the wrist pin with annular springs in the top and bottom groove of the "H" groove.

As to Claim 18, Ward discloses variable compression ratio is provided and such variable compression ratio is achieved by having a two part connecting rod with spring means providing the variable compression ratio.

As to Claim 19, Ward discloses spring means are two annular springs.

As to Claim 20, Ward discloses method for igniting, combusting, and expanding a burnt air-fuel mixture in an internal combustion engine and producing work by means of a movable piston 5 within a cylinder that has a cylinder head 6 with the combustion chamber located mainly in the head and fuel introduction and spark means 12a/118,12b/118a in or adjacent to the combustion chamber, and further including means for producing high squish flow and turbulence as the piston 5 nears top center at the engine compression stroke, the system constructed and arranged to have one or more spark plugs positioned and oriented such that as the piston 5 approaches top center, intense air flow passes through the spark gap to move and spread the spark towards the center of the combustion chamber, the improvement comprising steps for improving the lean burn capability of the engine under light load conditions and the knock rating under high loads by one or more of the following: a) providing two spark plugs 12a/118, 12b/118a at or near the edge of a high squish region controlled such that at light loads both plugs are fired, and at high load only one plug is fired; b) directly injecting fuel wherein intense air flow interacts with at least part of the injected fuel; c) directly injecting fuel with air-blast assistance and providing at least one spark within the injected fuel to be subjected to the air-blast; and d) varying compression ratio with high compression ratio at light loads and lower compression ratio at high loads.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the

invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 2,3 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ward (US 6,267,107) in view of Regeiro (US 5,320,075).

Ward discloses the limitations of claim 1 as described above.

Regeiro discloses two spark plugs located at or near high squish regions in the combustion chamber which is of a bathtub shape with large squish lands on the two sides of the length section of the bathtub, and a small squish zone at the far end of the bathtub containing the intake valve, and a smaller or no squish zone at the far end of the bathtub containing the exhaust valve. And wherein one spark plug is located in a more central part of the squish edge at a high squish point and the other at a lower squish point nearer to the exhaust valve.

It would have been obvious to modify **Ward** by employing two spark plugs located at or near high squish regions in the combustion chamber which is of a bathtub shape with large squish lands on the two sides of the length section of the bathtub, and a small squish zone at the far end of the bathtub containing the intake valve, and a smaller or no squish zone at the far end of the bathtub containing the exhaust valve and wherein one spark plug is located in a more central part of the squish edge at a high squish point and the other at a lower squish point nearer to the exhaust valve as taught by **Regeiro** **in order to** provide **Ward** engine with two spark plugs located at or near high squish regions in the combustion chamber which is of a bathtub shape with large squish lands on the two sides of the length section of the bathtub, and a small squish zone at the far end of the bathtub containing the intake valve, and a smaller or no squish zone at the

far end of the bathtub containing the exhaust valve. And wherein one spark plug is located in a more central part of the squish edge at a high squish point and the other at a lower squish point nearer to the exhaust valve.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to HYDER ALI whose telephone number is (571) 272-4836. The examiner can normally be reached on M-F (8:30-5:00).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, HENRY YUEN can be reached on (571) 272-4856. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Hyder Ali

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